

## SOP 16 - Planning

- A. The planning process for new experiments or operations should include consideration of safety, health, and environmental issues.
- B. The person designing the new experiment or process should consider what could go wrong and what should be done to plan for the consequences.
- C. Safety, health, and environmental planning elements:
  1. Chemical Reactions
    - a. The designer should thoroughly understand the reactions involved in an experiment.
    - b. The designer should attempt to determine what could go wrong with a reaction if impurities are present, chemicals get mixed mistakenly, temperatures or pressures get out of control, etc.
  2. Hazards
    - a. The designer should perform a risk analysis to identify the hazards associated with an experiment or operation.
    - b. The designer should evaluate energy sources (physical, chemical, thermal, radiological) in the hazard identification process.
    - c. Hazards with a high probability of occurrence or a high severity of outcome, or unacceptable combination thereof, should be addressed and controlled prior to initiating an experiment or operation.
    - d. Hazard reduction can be achieved (in decreasing order of effectiveness) by:
      - Designing a hazard out of a process.
      - Designing engineered safety features to reduce the hazard.
      - Installing barriers and barricades to prevent contact with the hazard.
      - Installing signs and warnings to annunciate the hazard.
      - Training employees.
  3. Safety Equipment and Protective Devices Necessary
    - a. After identifying the hazards of a new experiment or operation, the designer should specify what safety equipment and protective devices are necessary for the operation.
    - b. Safety equipment includes personal protective equipment, special shielding, special tools for the experiment (e.g., tongs), special storage arrangements for experimental components, emergency shutdown systems, primary and secondary containment vessels for spills, process control monitors, etc.
    - c. Protective equipment includes those fixtures that are more permanent in nature, such as safety showers, eyewash stations, hoods, fire extinguishers, automatic alarm systems, etc.
    - d. Safety equipment and protective devices should be inspected on a regular basis and maintained in proper operating condition.
  4. Training

- a. The designer shall assess training needs for a new experiment or process and verify that personnel have received such training.
  - b. Training includes orientation, hazard communication training, personal protective equipment, and emergency response.
- D. Emergency Response
  - a. The designer should consider what emergency measures should be taken in case control is lost of the physical, thermal, nuclear, or chemical energies of the experiment or process.
  - b. Consideration should be given to the arrangements and equipment necessary to handle first aid, medical, spill, fire, and accident emergencies.
  - c. The planning process should include consideration of the consequences of interrupted utility systems - electrical, water, gas, etc.
- E. Waste Disposal
  - 1. The designer should evaluate the proper waste disposal for new experiments or operations.
  - 2. Waste disposal operations should be planned for both routine and emergency situations.
  - 3. Adequate emergency waste handling equipment (e.g., absorbents, special canisters for waste, etc.) should be in place prior to initiating a new experiment or operation.
- F. Review of safety, health, and environmental planning as a component of the design of experiments or processes will not be required in many cases; however, in special circumstances, or where the designer has special concerns, the Collateral Duty Safety Officer should be consulted during the planning process and/or prior to the beginning of the new experiment or process.